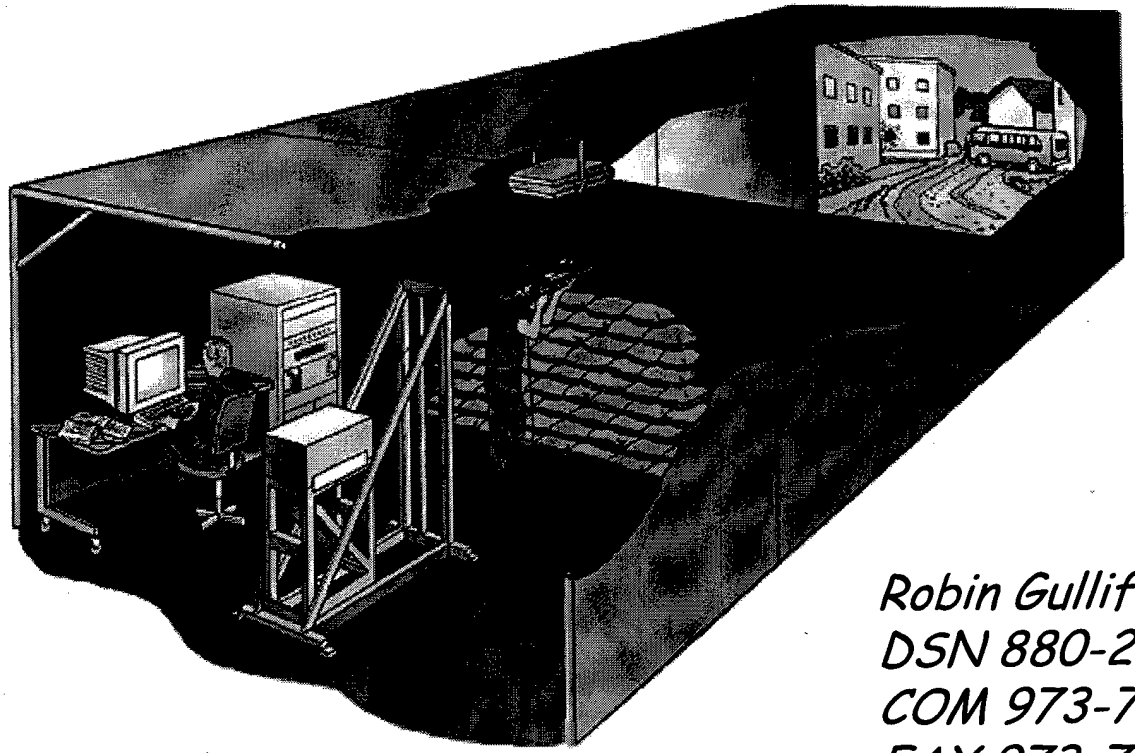
NDIA SMALL ARMS SYSTEMS
16-18 JUNE 1998

SMALL ARMS SIMULATOR



Robin Gullifer
DSN 880-2218
COM 973-724-2218
FAX 973-724-2204
e-mail: rgullif@pica.army.mil

Light

SIMULATOR BACKGROUND

» ***History***

- Developed by Naval Air Warfare Center, Training Systems Division (NAWCTSD)
- Basic Research and Development Funded by Live Fire Testing and Training Initiative
- Built from Existing Training Systems, but

More Accurate Than Any Trainer!

.1 MIL TRACKING ACCURACY!

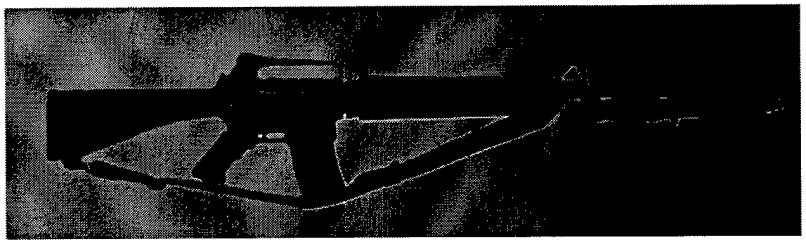
SIMULATOR STUDIES

»*STUDIES CONDUCTED*:

- M16 Validation
- M203 Validation
- Close Combat Optic (CCO)
- Objective Individual Combat Weapon (OICW) Aiming Study
- OICW Aiming Study for Combat ID
- Unsupported Firing
- M4 Carbine Alternate Butt Stock
- Rapid Target Acquisition/Helmet Orientation System (RTA/HOS) for Force XXI Land Warrior (FXXI LW)

SIMULATOR STUDIES

- *M16 Validation Study*
  - Duplicated the Advanced Combat Rifle Intermediate Range
  - Ran Infantry Soldiers Through 66 Target Scenario
  - Results Examined by AMSAA



- ***Conclusion: Simulator Correctly Models the M16 Rifle!***

SIMULATOR STUDIES

» *M203 Validation Study*

- Conducted Firing Test to Gather Data
- Duplicated Range in the Simulator
- Ran Infantry Soldiers Through 16 Target Scenario
- Correlation Between Live Fire and Simulator Results

» ***Conclusion: Simulator Correctly Models the M203 Grenade Launcher!***

Light

SIMULATOR STUDIES

» *M68 Close Combat Optic (CCO)*

- 24 Soldiers from Army, Marine Corps, Air Force and Navy
- 32 Target Scenario with Multiple Targets
- Evaluated the CCO Located in Three Different Locations
- Compared Results to Iron Sight Firings
- Results:
  - No Statistically Significant Difference in Hit Performance Between CCO and Iron Sight
  - CCO Near Performance Better Than CCO Mid or Far
  - Decrease in Time to Get on Target for CCO v. Iron Sight
  - Aim Error for CCO Slightly Larger for CCO v. Iron Sight

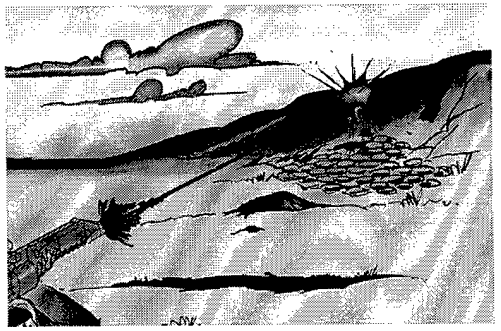
» ***CONCLUSION: M68 Improves Performance!***

Light

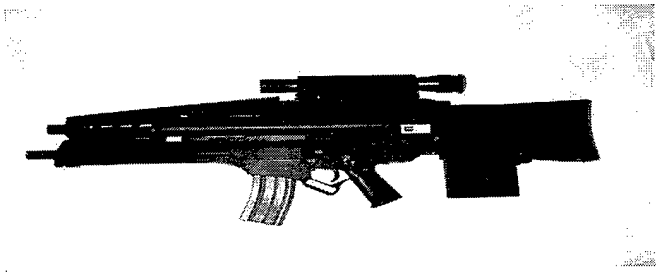
SIMULATOR STUDIES

» *Objective Individual Combat Weapon (OICW) Aiming Study*

- Goal: Gather Aiming Information Based Upon Posture and Weapon Weight
- 12 Soldiers Volunteered
- Data Used to Help Design Fire Control System Based Upon the Gunners Natural Wobble



- 16 Targets
  - Stationary and Moving, 75-300m
  - Kneeling and Supported Postures

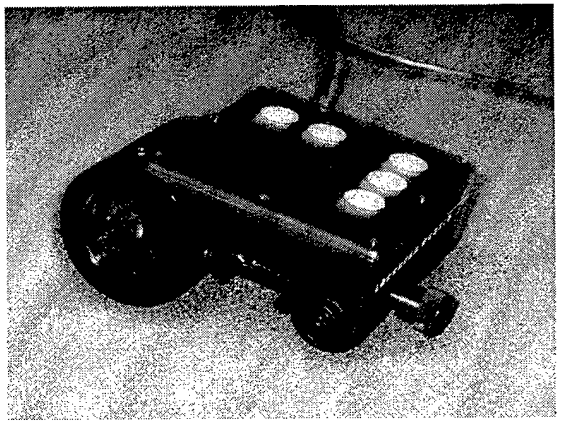


Light

SIMULATOR STUDIES

» *Combat ID Analysis*

- Data Collected from OICW Study Used to Examine the Ability to Hold on Target for Extended Periods of Time
- Results Influenced the Design of Dismounted Infantry Combat ID System in Terms of Beam Width and Time Line Implications



SIMULATOR STUDIES

» *Unsupported Firing*

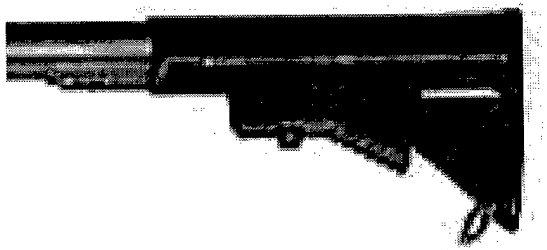
- Goal: Gather Aiming Information to Characterize the Aiming Error When Firing From an Unsupported v. Supported Position
- 24 West Point Cadets Fired Against the Record Fire Course
- Data Collected Analyzed for Aim Error, Used in Error Budget Analysis on Land Warrior System

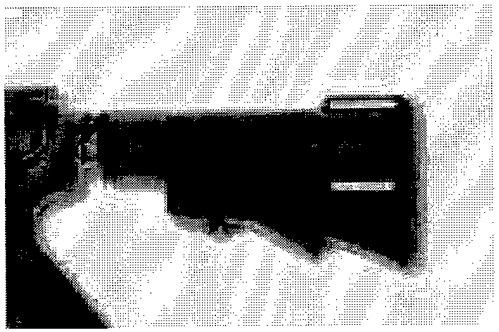
Light

M4 CARBINE ALTERNATE BUTTSTOCK STUDY

» *M4 Carbine Butt Stock*

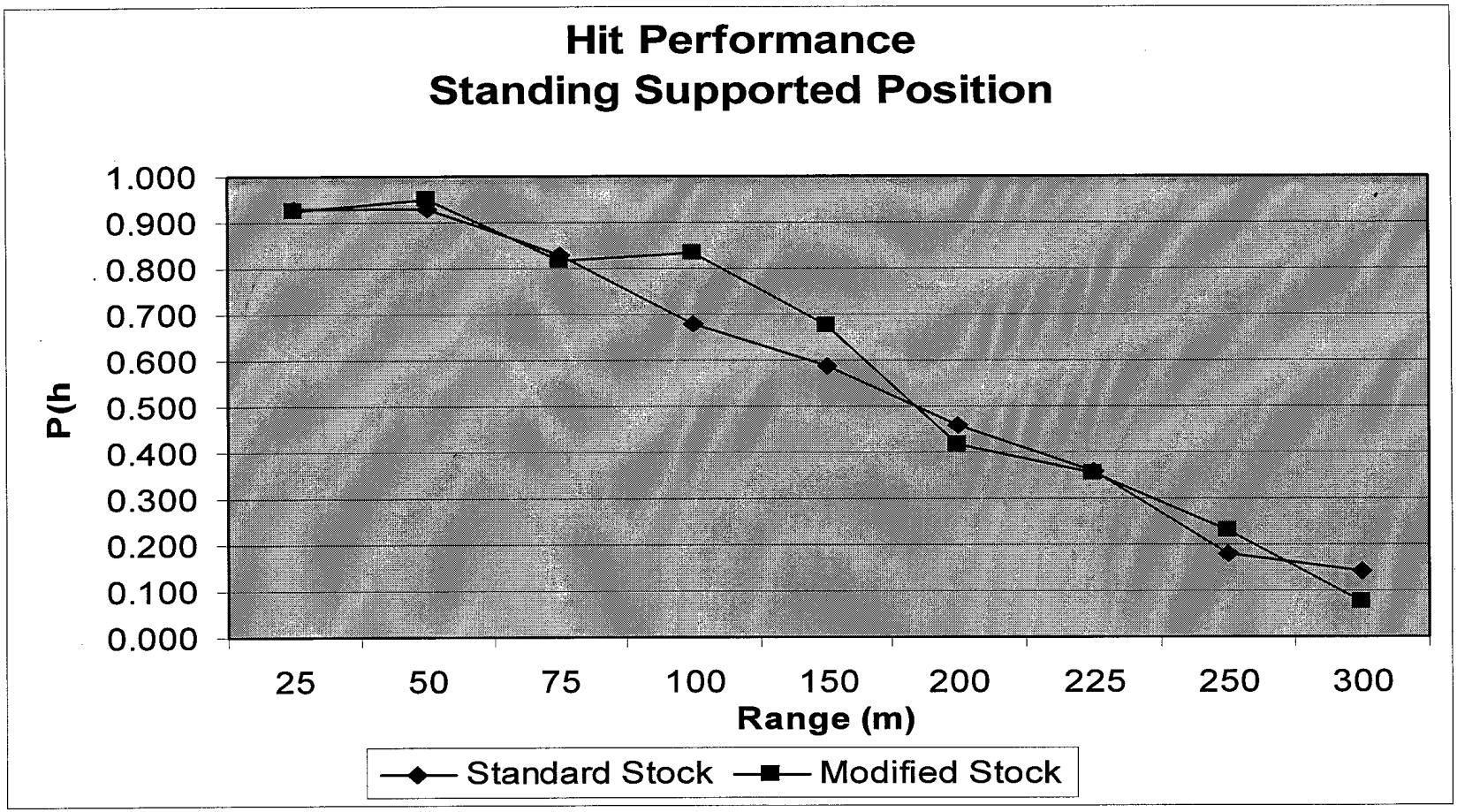
- Goal: Quantify Performance Difference Between Fielded Butt Stock and New Improved Butt Stock
- Used Stereo-Lithographic Model of New Butt Stock
- 14 Local Soldiers Fired 40 Target Scenario From Standing and Prone Supported Positions





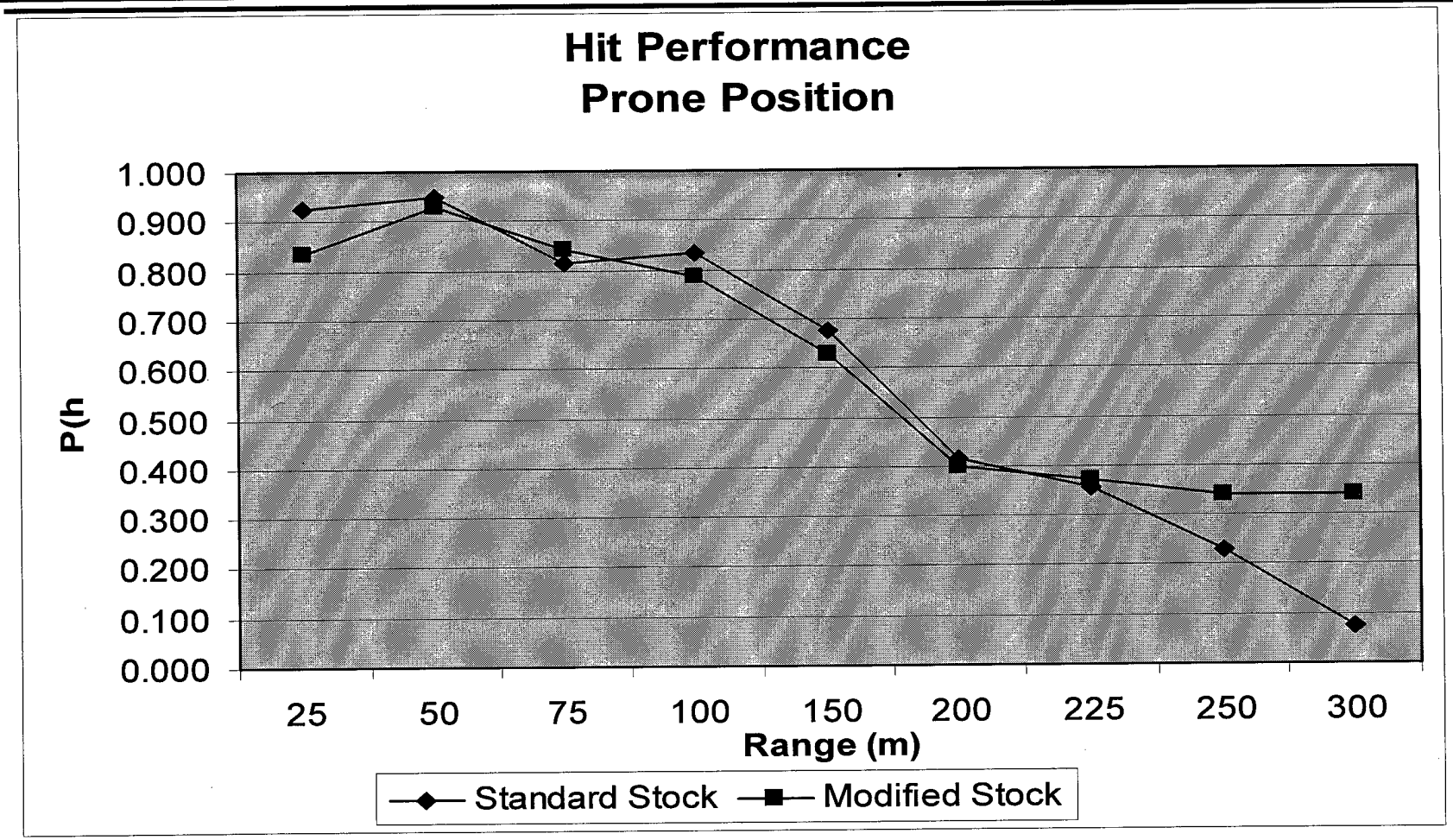
Light

M4 CARBINE ALTERNATE BUTTSTOCK STUDY



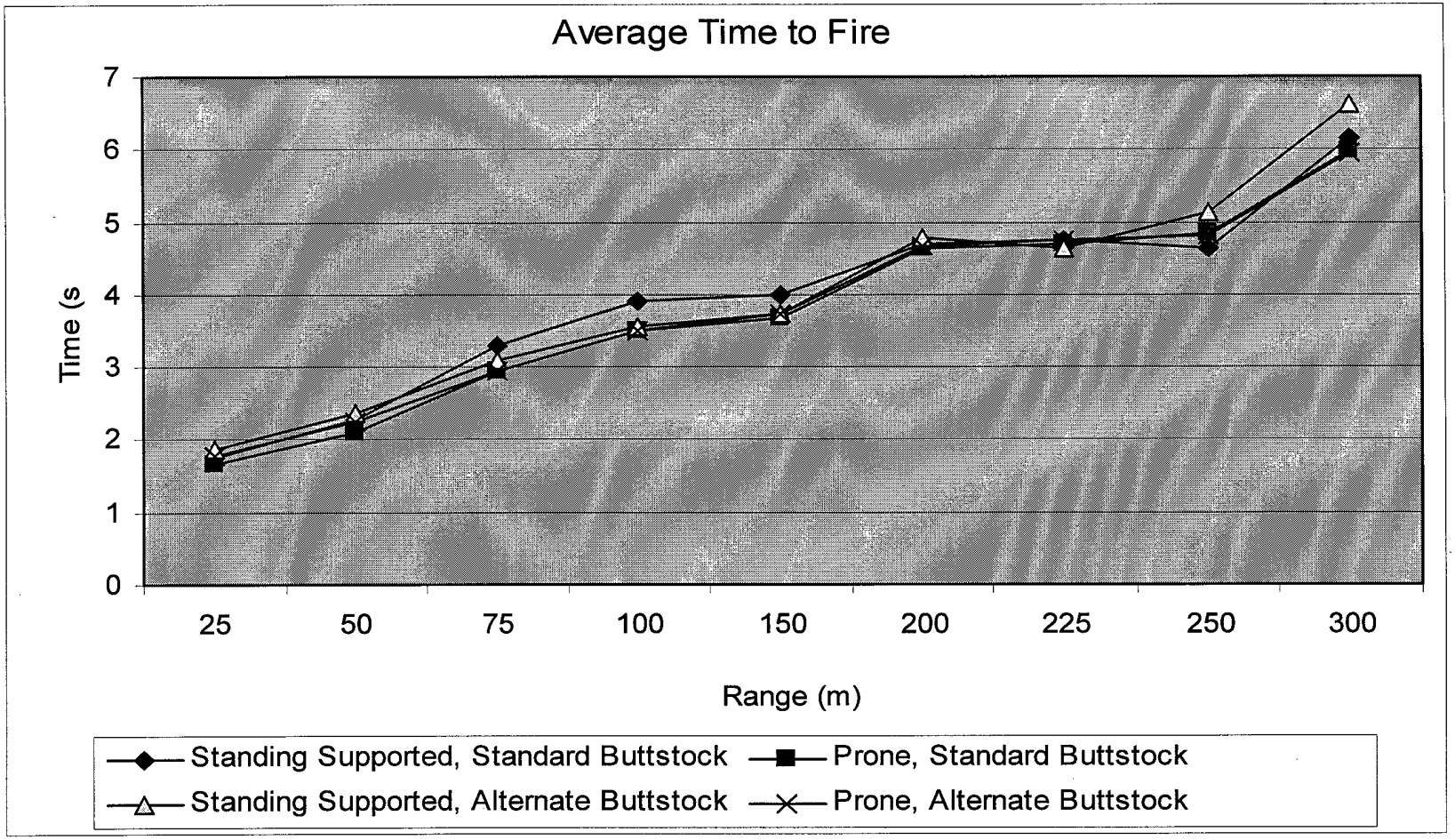
Light

M4 CARBINE ALTERNATE BUTTSTOCK STUDY



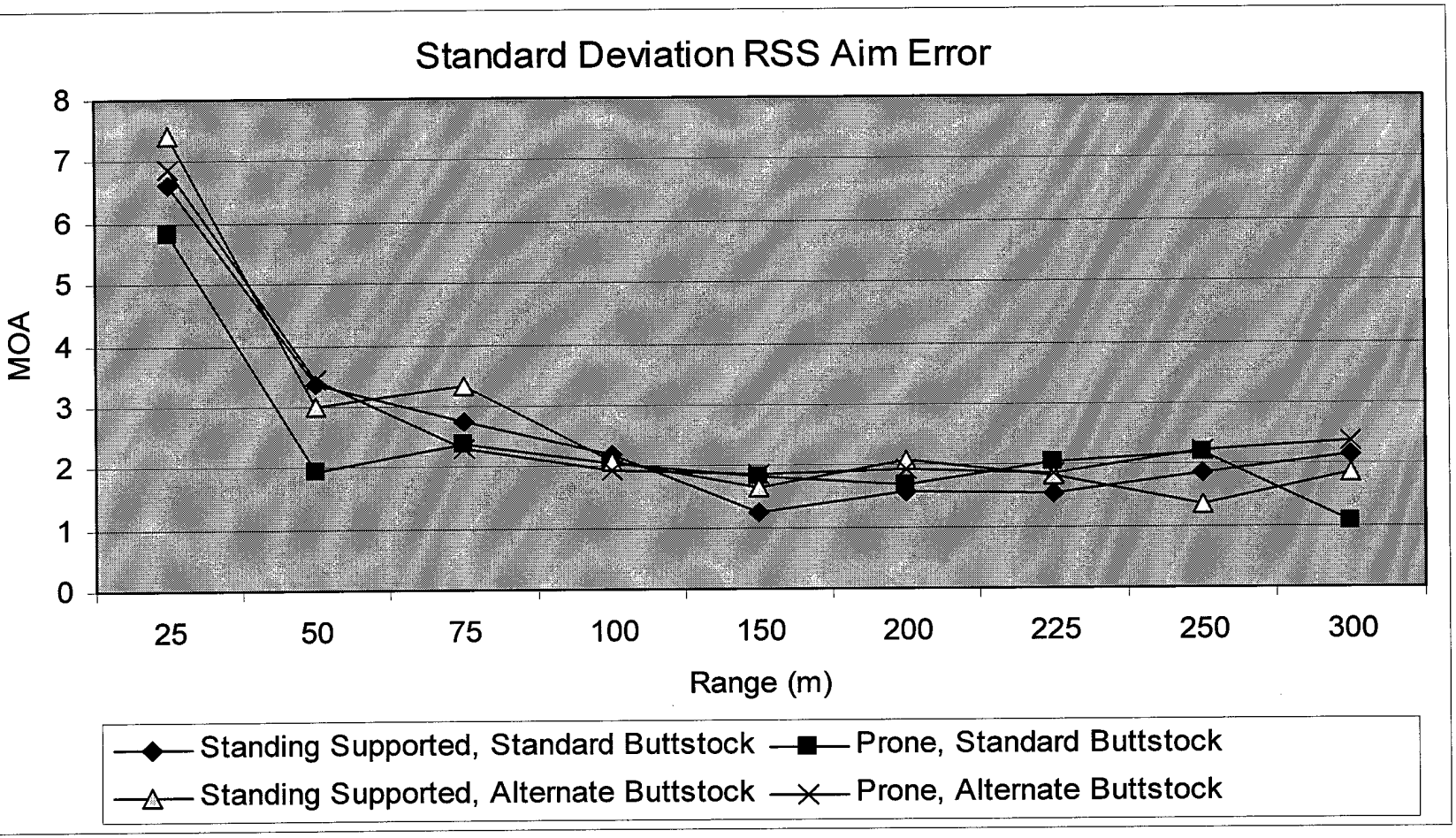
Light

M4 CARBINE ALTERNATE BUTTSTOCK STUDY



Light

M4 CARBINE ALTERNATE BUTTSTOCK STUDY



Light

M4 CARBINE ALTERNATE BUTTSTOCK STUDY

»Conclusions:

-Change in Buttstock:

- -Does Not Alter Weapon System Performance
- -Does Provide Improved Buttstock with Sling Attachment
- -Does Provide More Familiar Interface Since Buttstock is Similar in Size and Shape to the M16

-There is No Statistically Significant Difference in Performance Between the Existing Buttstock and the New Improved Buttstock for:

- -Hit Performance
- -Time to Fire
- -Aim Error

Light

FXXI LW RTA/HOS SIMULATOR EFFORT

» *Force XXI Land Warrior Simulation Efforts*

- RTA/HOS (Helmet Orientation Sensor/Rapid Target Acquisition) 20-22 Jan 98
- Quantify the Impact on the Engagement Timeline When Switching From I^2, Wide Field of View to Thermal, Narrow Field of View
- Evaluate Aim Error When Using Remote Aiming Technique
- Evaluate Performance When Firing Unsupported

Light

FXXI LW RTA/HOS SIMULATOR EFFORT

» **RTA/HOS Configuration:**

- Soldier Equipped With LW Image Intensified (I^2) Helmet Mounted Display With Filter to Block Tracker Spot From View
- HOS System Attached to Back of Helmet, Adding Weight
- Wiring Harness with Mini-Computer and LW DCIM

- Weapon Mounted Sensors:
  - 4 lb. Block Representing Integrated Sight
  - Video Camera
  - Weapon Sensor Which Includes the Compass
  - Button for Switching Between Thermal and I^2

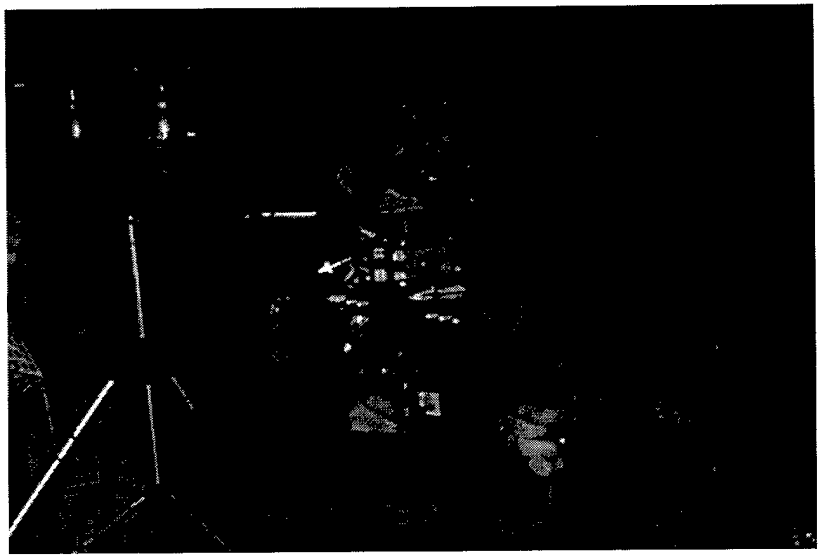
FXXI LW RTA/HOS SIMULATOR EFFORT

»LW Configuration:

- Same as RTA/HOS Configuration, But Weight Added to Weapon in Form of LRF/DCA Stereo Lithography Model and PAQ-4C

»Test Set-up

- Two Weapon Configurations:
  - LW: M4 with 4 lb. Sight, LRF/DCA, and PAQ-4C
  - RTA/HOS: M4 with 4 lb Sight
- Two Firing Positions:
  - Standing Unsupported
  - Kneeling Supported



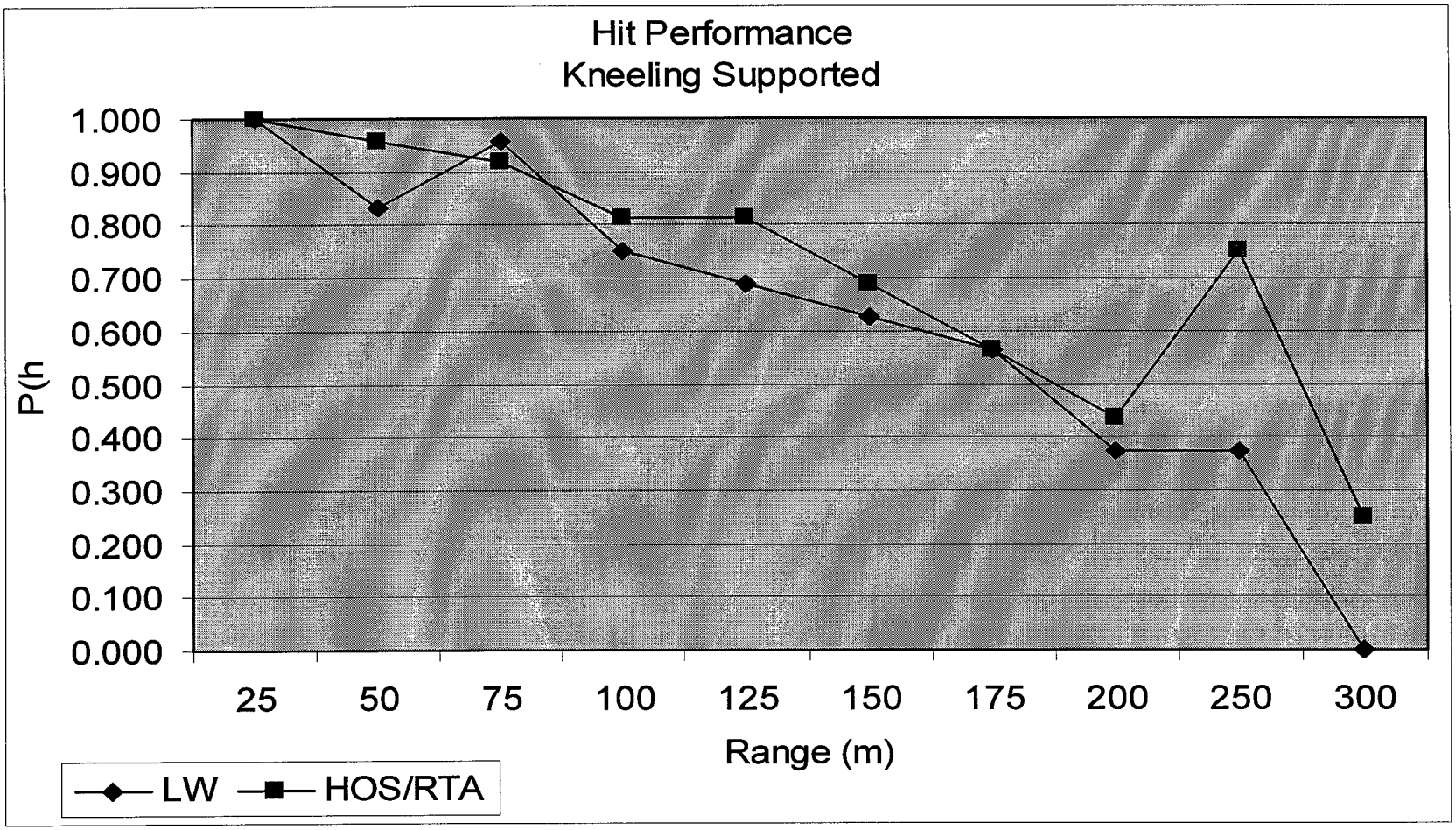
Light

FXXI LW RTA/HOS SIMULATOR EFFORT

» *Test Description:*

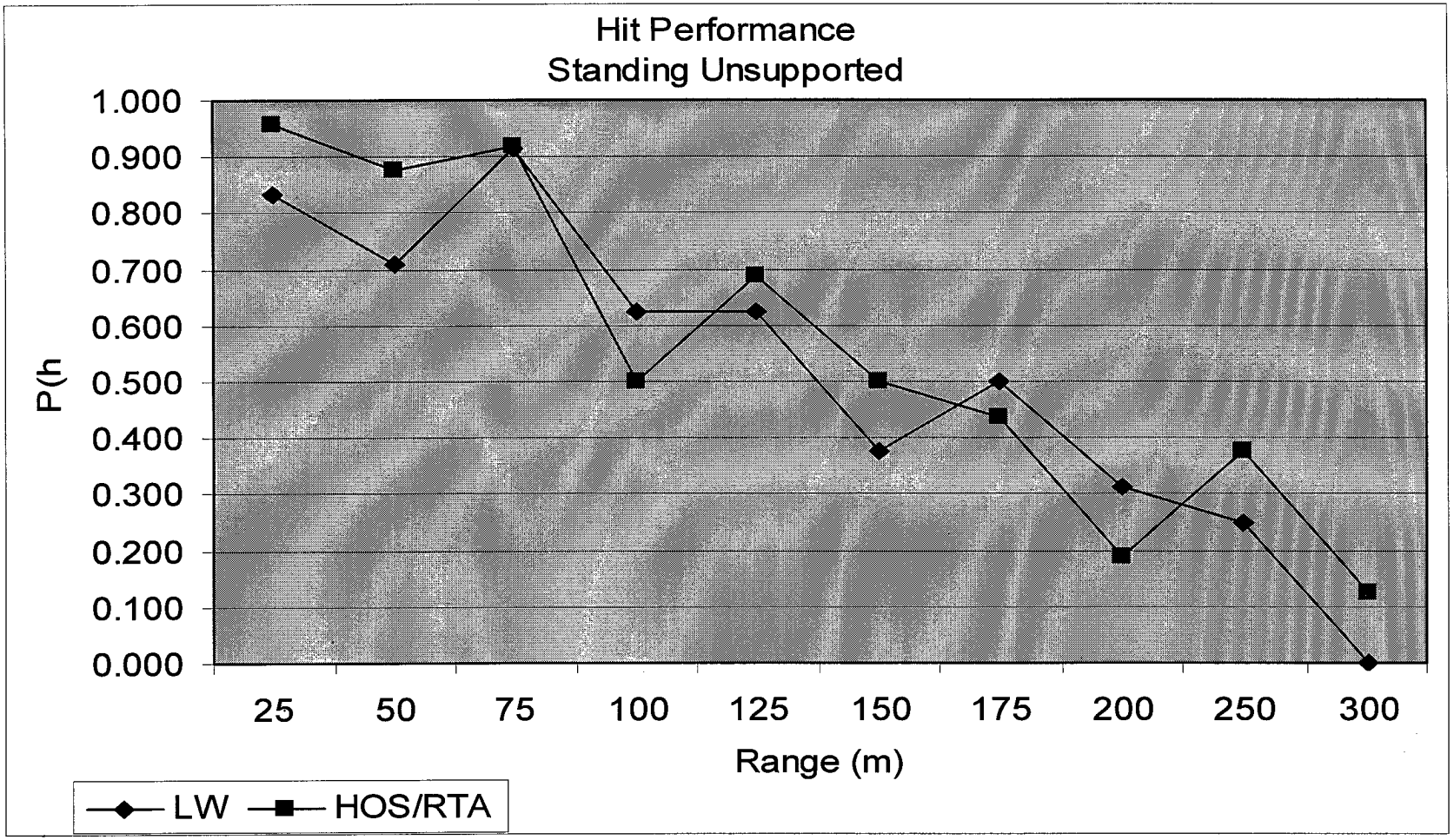
- Participants: 4 Soldiers, 4 Marines
- Training Scenario: 10 Targets Located at Various Ranges
- Test Matrix:
  - 2 Positions: Standing Unsupported, Kneeling Supported
  - 2 Weapons Configurations:
    - LW: M4 w/4lb. Sight, LRF/DCA and PAQ-4C
    - RTA/HOS: M4 w/4lb. Sight
- Test Scenario: 21 Targets Between 25-300m With 2-4s Between Targets

FXXI LW RTA/HOS SIMULATOR EFFORT



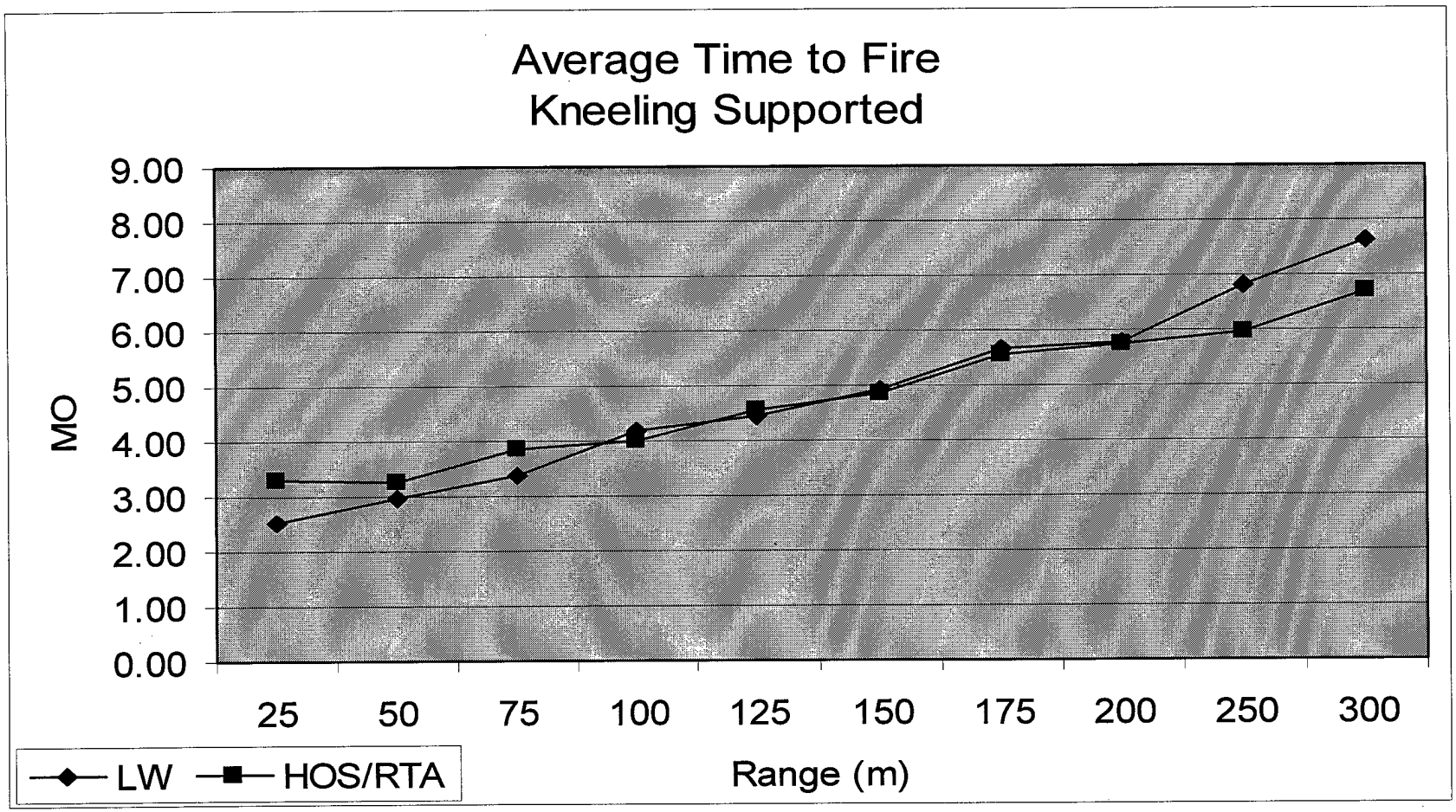
Light

FXXI LW RTA/HOS SIMULATOR EFFORT



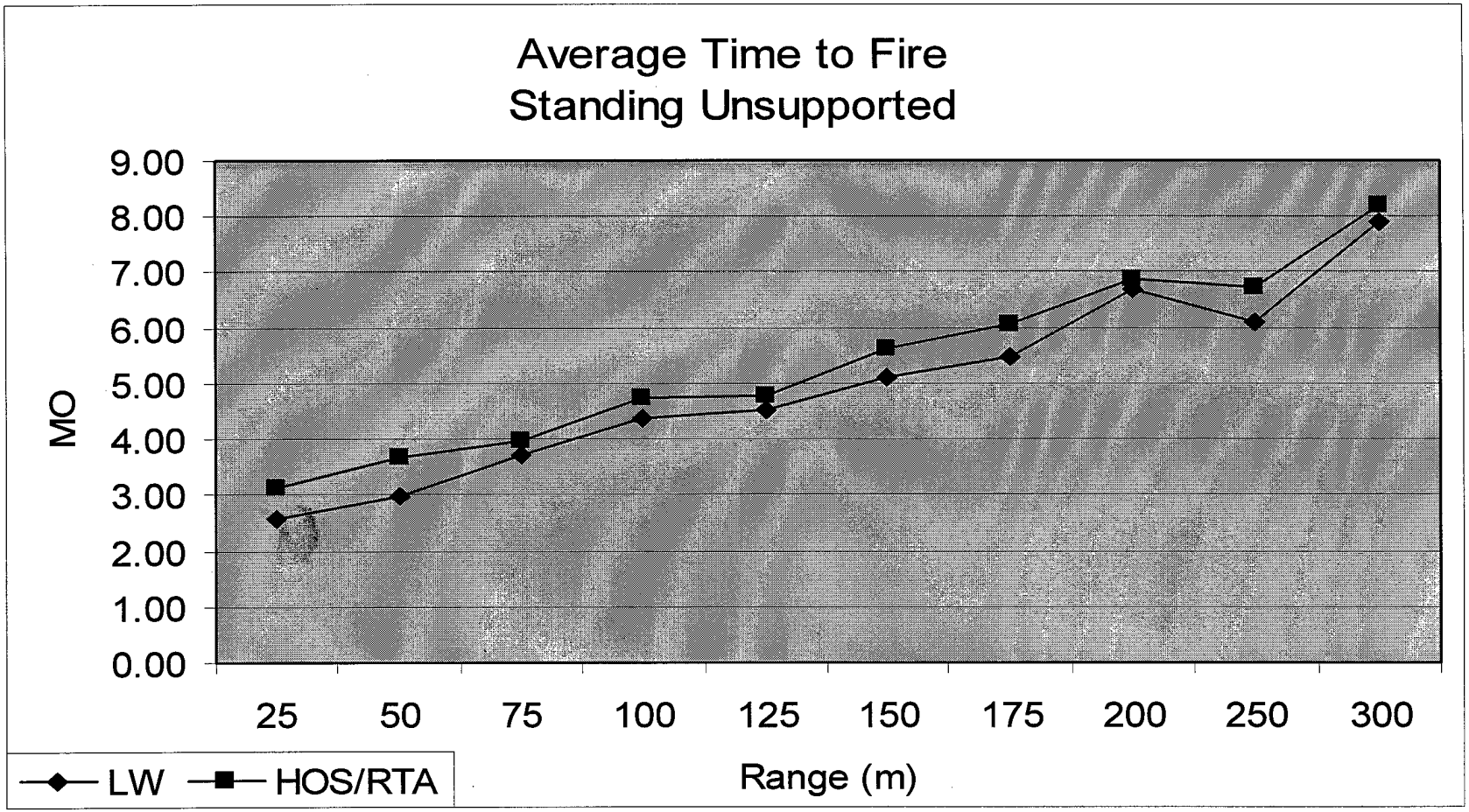
Light

FXXI LW RTA/HOS SIMULATOR EFFORT



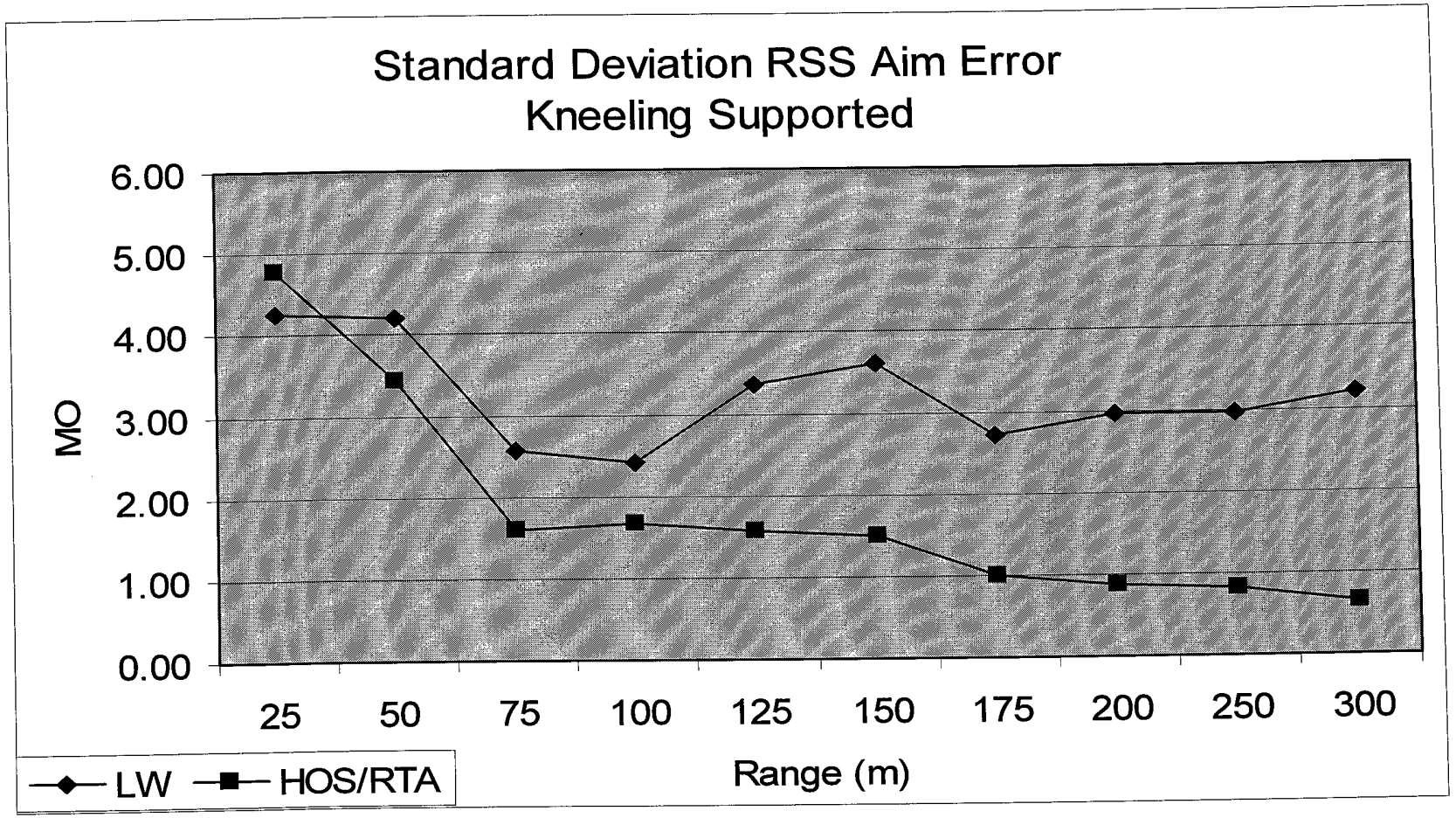
Light

FXXI LW RTA/HOS SIMULATOR EFFORT



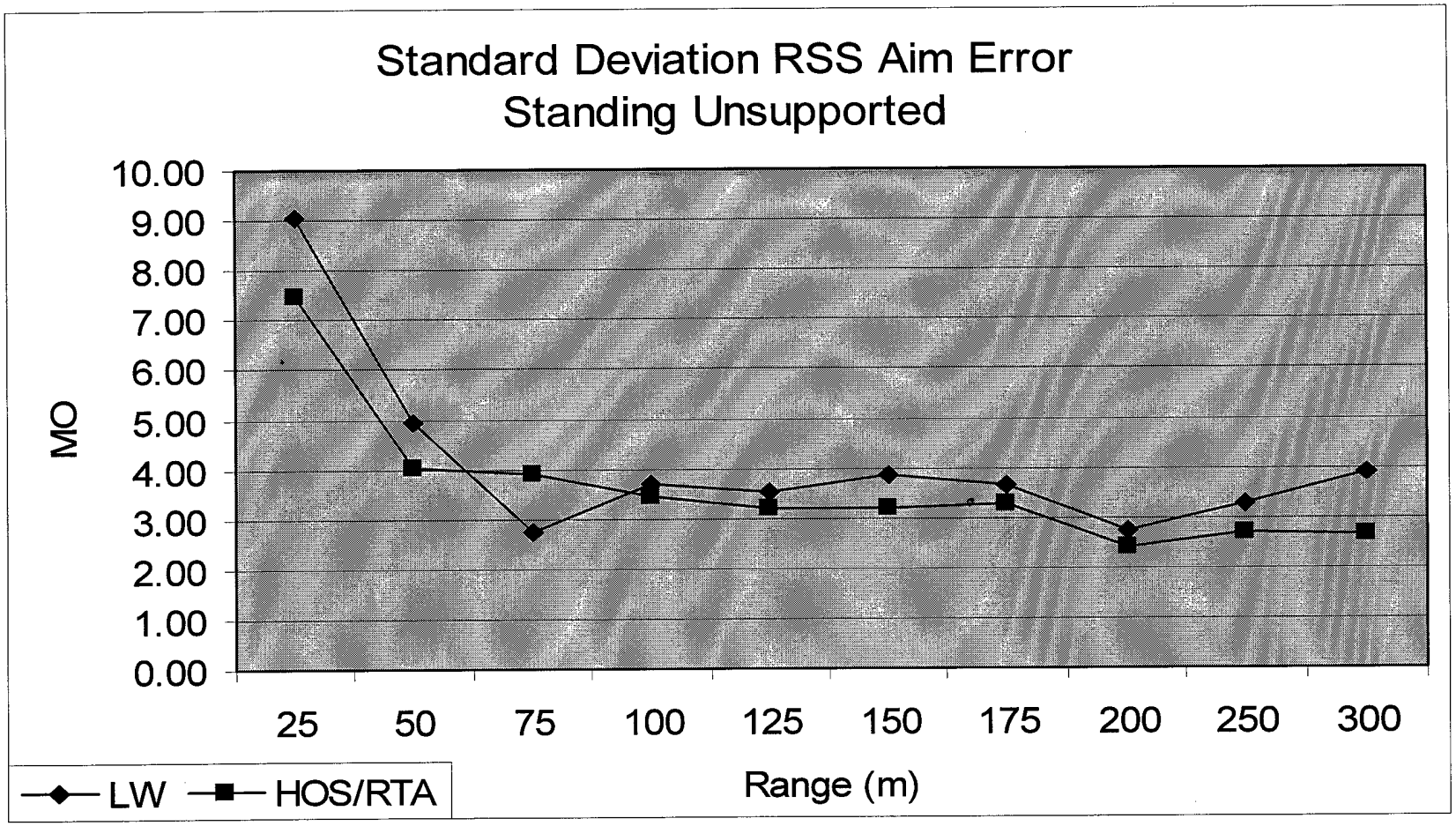
Light

FXXI LW RTA/HOS SIMULATOR EFFORT



Light

FXXI LW RTA/HOS SIMULATOR EFFORT

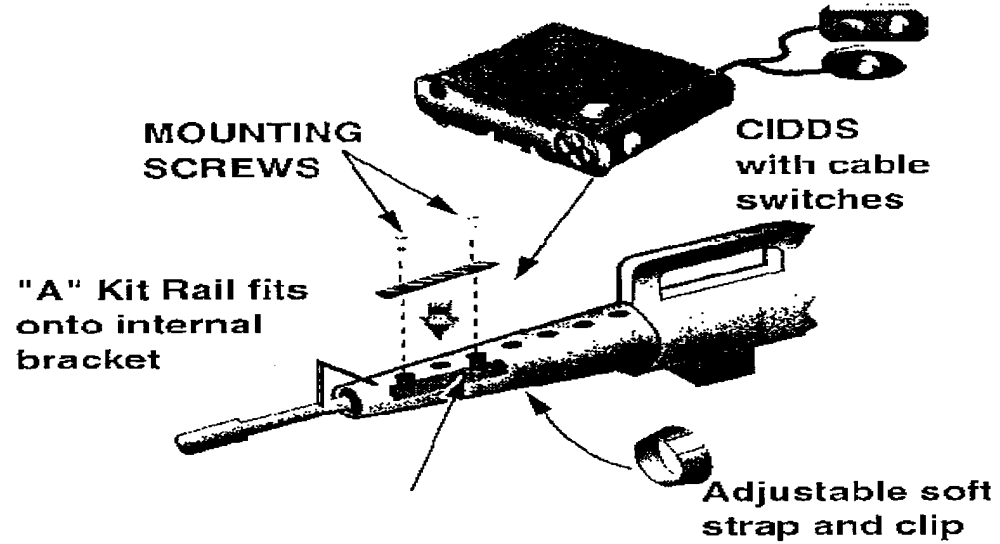


Light

FXXI LW RTA/HOS SIMULATOR EFFORT

- Conclusions:
  - Simulator Data Collected For Supported & Unsupported Configurations On:
    - Hit Performance
    - Time to Fire
    - Aim Error
  - There is No Statistically Significant Difference in Performance Between Land Warrior and RTA/HOS for:
    - Hit Performance
    - Time to Fire
    - Aim Error

FUTURE STUDIES



» Combat ID Simulation Efforts

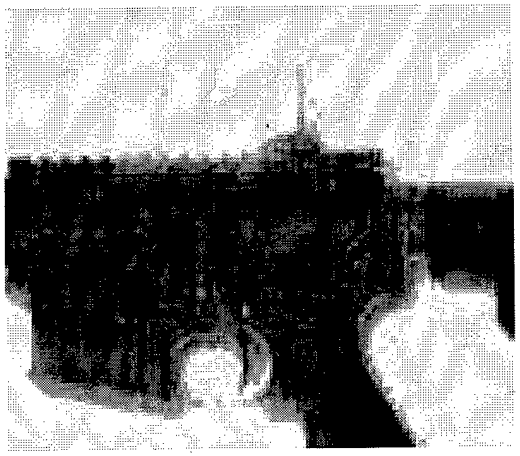
- Weapon Equipped With CID Unit
- Simulator Modified to Accept ID Capability: Targets Will Be Randomly Tagged as Friend or Unknown, Audible and Visual Signal Returned After Identification
- Effort to Identify the Impact on Target Engagement Timeline of Adding ID Function

FUTURE STUDIES

»OICW

-Perform Technical Testing of Weapon System

-Train Soldiers on Use of Weapon System Including Fire Control



»Back-up Iron Sight (BUIS)

-Determine Performance Parameters When Using the BUIS

SUMMARY

»*FUTURE GROWTH*

- Expand System to Accommodate Fire Control Features Such as Optics, Laser Rangefinders, Combat ID
- Expand Weapons Base to Include Crew Served Weapons
- Multi-lane Capability and Interoperability with Other Simulators